

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE (AUTONOMOUS)-POLLACHI

553	B.A.Economics	Core III Elective: Rural Economics	22UEO5E3	2022
554	B.A.Economics	Core III Elective: Urban Economics	22UEO6E3	2022
555	B.A.Economics	Core III Elective: Computer Application in Economics	22UEO6E5	2022
556	B.A.Economics	Core III Elective: Health Economics	22UEO6E6	2022
557	B.Sc. Mathematics	Core I: Classical Algebra	22UMS101	2022
558	B.Sc. Mathematics	Anicillary Mathematics for Physics I	22UPS1A1	2022
559	B.Sc. Mathematics	Anicillary Mathematics for Physics II	22UPS2A2	2022
560	B.Sc. Mathematics	Anicillary Mathematics for Chemistry I	22UCY1A1	2022
561	B.Sc. Mathematics	Anicillary Mathematics for Chemistry II	22UCY2A2	2022
562	B.Sc. Mathematics	Core III: Trigonometry, Vector Calculus and Fourier Series	22UMS203	2022
563	B.Sc. Mathematics	Core VI: Numerical Techniques	22UMS306	2022
564	B.Sc. Mathematics	Core X: Real Analysis-I	22UMS511	2022
565	B.Sc. Mathematics	Core XIV: Real Analysis-II	22UMS615	2022
566	B.Sc. Mathematics	Core Elective III: Fundamentals of Differential Geometry	22UMS6E5	2022
567	B.Sc. Mathematics	Project	22UMS6P1	2022
568	B.Sc. Physics	Optics & Spectroscopy	22UPS508	2022
569	B.Sc. Physics	Mechanics	22UPS507	2022
570	B.Sc. Physics	Core Elective II Digital Circuit Systems & Microprocessor	22UPS6E16	2022
571	B.Sc. Physics	Core Elective II: Biomedical Instrumentation	22UPS6E17	2022
572	B.Sc. Physics	Core Elective II: Nano Materials and Applications	22UPS6E18	2022
573	B.Sc. Botany	Major Paper IV- Cell Biology, Anatomy and Embryology	22UBY304	2022
574	B.Sc. Botany	Major Paper V – Biochemistry, Biophysics & Bioinstrumentation	22UBY405	2022
575	B.Sc. Botany	Non Major elective: Bioinformatics	22UBY4N22	2022
576	B.Sc. Botany	Major Paper – VII - Taxonomy of Angiosperms and Economic Botany	22UBY507	2022
577	B.Sc. Botany	Elective I– Herbal & Ethno Botany	22UBY5E2	2022

BoS
Highlighted



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New Course Introduced

PG AND RESEARCH DEPARTMENT OF MATHEMATICS.

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE
POLLACHI

13th Board of Studies Meeting in the Department of
Mathematics

Date & Time: 04/06/2022 & 10.00 A.M.

Agenda

BoS / DM 13.1	:	Welcome address and Opening Remarks by Chairman, Board of studies in the DEPARTMENT OF MATHEMATICS
BoS / DM 13.2	:	Confirmation of the Minutes of the 13 th / Previous meeting of Board of studies in the DEPARTMENT OF MATHEMATICS held on 04/06/2022 and Action taken report of 12 th meeting of Board of studies
BoS / DM 13.3	:	13.3.1 Syllabus of I BSc MATHEMATICS under Regulation 2022
		13.3.2 Syllabus of II BSc MATHEMATICS under Regulation 2022
		13.3.3 Syllabus of III BSc MATHEMATICS under Regulation 2022
		13.3.4 Syllabus of I MSc MATHEMATICS under Regulation 2022.
		13.3.5 Syllabus of II MSc MATHEMATICS under Regulation 2022.
BoS / DM 13.4	:	Suggestion given by BOS Members
BoS / DM 13.5	:	

DM – Short Form of Department of Mathematics


Head of the Department

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DEPARTMENT OF MATHEMATICS

MINUTES OF BOS MEETING

The 13th Meeting of the Board of Studies of the Department of Mathematics was held on 04/06/2022 at
10.00 a.m. in the Department of
Mathematics, Nallamuthu Gounder Mahalingam College, Pollachi-642 001

1. The following members were present:

1.	Dr. V. INTUMATHI Associate Professor and Head	Chairman
2.	Dr. J. JAYASUDHA Assistant Professor	Internal Members
3.	Dr. R. SANTHI Assistant Professor	
4.	Dr. V. CHITRA Assistant Professor	
5.	Dr. S. SIVASANKAR Assistant Professor	
6.	Mr. P. SIRAVANAN Assistant Professor	
7.	Dr. S. KALEESWARI Assistant Professor	
8.	Mrs. A. GNANASOUNDARI Assistant Professor	
9.	Dr. N. SELVANAYAKI Assistant Professor	
10.	Dr. M. MAHESWARI Assistant Professor	
11.	Mrs. M. AMSAVENI Assistant Professor	
12.	Mr. S. EARNEST RAJADURAI (SF Mathematics) Assistant Professor and Head	
13.	Ms. S. SENPAGAM (SF Mathematics) Assistant Professor	
14.	Mr. R. ABINPRAKASH (SF Mathematics) Assistant Professor	
15.	Dr. S. MONIKANDAN Associate Professor Department of Mathematics M. S. University Tirunelveli-627 012	University Nominee
16.	Dr. P. S. SIVAKUMAR Associate Professor Department of Mathematics Govt. Arts College	Academic Experts


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	Udumalpet - 642 126 Mobile No. : 98423 62234	
17.	Ms. S. RAGHAVI 1/59, Kuralkuttai, Udumalpet- 642154 (Alumini)	Alumnus nominated by Principal / HoD
18.	Ms. C. KOWSALYAHARISHANTHI 115b, KaliyammanKovil Street Pakkothipalayam Suleeswan Patti(PO) Pollachi - 642 006 Mobile No. : 63747 86242 (Alumni)	
19.	Dr. M. SIVASUBRAMANIAN Assistant Professor Department of Mathematics Government Arts College Udumalpet-642 126 Mobile No.: 9095542186	Academic Auditor(UG)
20.	Dr. C. JANAKI Assistant Professor Department of Mathematics L.R.G. Govt. Arts College for Women Tiruppur - 641 604 Mobile No. : 73390 90548 E-Mail: janakicsekar@gmail.com	Academic Auditor(PG)
21.	Ms. K. Kalaivani III B. Sc. Mathematics	Student Members
22.	Ms. G. Manjueswari II M. Sc. Mathematics	



Head of the Department

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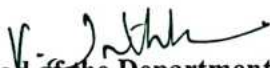
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BoS/DM 13.1 WELCOME ADDRESS AND OPENING REMARKS BY CHAIRMAN, BOARD OF STUDIES IN THE DEPARTMENT OF MATHEMATICS

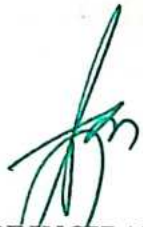
The Chairman, BoS of the Department of Mathematics welcomed and introduced the members of 13th Board of Studies and thanked each one of them for sparing their valuable time to attend the meeting.

BoS/DM13.2 TO CONFIRM THE MINUTES OF 12th BOS MEETING HELD ON 22/05/2021. The minutes of the 12th Board of Studies meeting held on 22/05/2021 were communicated to the members. The comments received have been incorporated and placed for confirmation. The same was approved by the 12th Academic council.

~ Action Taken Report (Enclosed in Annexure 1)


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BoS/DM 13.3

BoS/DM 13.3.1

I BSc MATHEMATICS (I & II SEMESTER)

- **In Classical Algebra(22UMS101)**, the content of the first unit is modified as finding the solution of numerical, algebraic and transcendental equations. (20%)
Text Book: Venkataraman M. K, Numerical Methods in Science and Engineering, The National Publishing Company, Madras, 2009.
- **In Calculus(22UMS102)** paper, include the topics Curvature and Radius of curvature and Envelopes (Excluding Polar co-ordinates) in Unit-II instead of different integrals of PDE, Standard type of first order equation (Type-III and Type-IV). (10%)
- The Unit-I of the course **Classical Algebra** "Sequences and Series" to be included as Unit-II in the course **Trigonometry, Vector Calculus and Fourier series(22UMS203)**. (20%)
- **In Mathematical Statistics-I (22UMS1A1)**, include the topic "Introduction to Random Variables"- Simple problems. (10%)
- The experts of BoS Meeting strongly recommended to enrich the syllabi of
 - **Ancillary Mathematics for Physics-I,**
 - **Ancillary Mathematics for Chemistry-I**
 - **Ancillary Mathematics for Physics-II and**
 - **Ancillary Mathematics for Chemistry-II,**

With the following changes

➤ **Ancillary Mathematics for Chemistry-I(22UCY1A1)**

Unit-I

The topics eigen values, eigen vectors to be included along with the existing topics.

Unit-II

Combine Unit-II and Unit-III as a single unit.

Unit-III

To introduce the summation of Binomial series, Exponential Series and Logarithmic series.

Unit-IV

To introduce Gauss Elimination, Gauss Jordan methods and finding inverse of a matrix.

Text Book:Kandasamy P, Thilagavathy K and Gunavathi K, Numerical Methods, S. Chand company Ltd, 2012.

Unit-V

To include relation between the Beta and Gamma function along with the existing topics (55%)

The same syllabus to be incorporated for Ancillary Mathematics for Physics-I(22UPS1A1) (55%)

➤ **Ancillary Mathematics for Chemistry-II(22UCY2A2),**

Unit-I

The contents of Unit-II to be shifted to Unit-I

Unit-II

To introduce inverse Laplace transforms and solving ODE using Laplace transforms

Unit-III and Unit-IV no changes

Unit-V

To include Gauss divergence theorem along with the existing topics (50%)

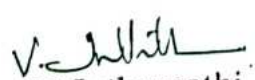
➤ **Ancillary Mathematics for Physics-II(22UPS2A2)**

Unit-I, Unit-II, Unit-III and Unit-IV same as Ancillary Mathematics for Chemistry-II

Unit-V

To include Green's, Stokes Theorem, Gauss Divergence Theorem and remove Exponential Series.

BoS/DM 13.3.2


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- II BSc MATHEMATICS (III & IV SEMESTER)
- **In Numerical Techniques (22UMS306)** paper all contents of simultaneous linear algebraic equation to be made as Unit-I and to introduce Interpolation unequal intervals in Unit-II with the existing contents. (20%)
 - The course **Programming in C(22UMS408)** and **Programming Lab in C(22UMS409)** to be shifted to Semester-IV.

BoS/DM 13.3.3

III BSc MATHEMATICS (V & VI SEMESTER)

- The course **OR-I(22UMS512)** to be shifted to Semester-V
- The course **OOP with C++(22UMS5E1)** and **Programming Lab in OOP with C++(22UMS5E3)** to be shifted to Semester-V
- In the course **Programming Lab in OOP with C++(22UMS5E3)**, the last five Programmes shall be framed by comparing both C and C++.
- The course **OR-II(22UMS616)** to be shifted to Semester-VI. (10%)

These changes have been implemented with effect from the academic year 2022-2023 in the respective semesters.

BoS/DM 13.3.4

I MSc MATHEMATICS (I & II SEMESTER)

- The entire syllabus of the course Mathematical Statistics is revised and to be implemented the following text book,
John E. Freund's Mathematical Statistics with Applications Irwin Miller, Marylees Miller, Eighth Edition.

BoS/DM 13.3.5

II MSc MATHEMATICS (III & IV SEMESTER)

The presented syllabus was accepted by the experts fully without further suggestions.

BoS/MA 13.4 SUGGESTIONS GIVEN BY THE BoS MEMBERS

13.4.1: Dr. P.S. Sivakumar and academic auditor Dr. M. Sivasubramanian gave the following suggestions:

1. Advised to change few topics in some major papers for UG program to enrich the fundamental concepts.
2. Strongly recommends to update the syllabi of Ancillary Mathematics papers for Physics and Chemistry programs.

13.4.2: Dr. S. Monikandan gave suggestion to introduce certificate courses/valued added courses for PG programs.


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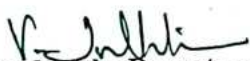

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13.4.3: Ms. K. Kalaivani requested to interchange the scheme of the program in order meet the placement requirements.

The members had a brainstorming discussion and interaction among themselves. After discussion, fruitful suggestions were incorporated appropriately in the Curriculum and Syllabi.

Based on the suggestions given by the members, BOS resolved to recommend the following to the Academic Council for further approval.

- a) The syllabus of First Year B.Sc., under Regulation 2022-23
- b) The syllabus of Second Year B.Sc., under Regulation 2022-23
- c) The syllabus of Third Year B.Sc., under Regulation 2022-23
- d) The syllabus of First Year M.Sc., under Regulation 2022-23
- e) The syllabus of Second Year M.Sc., under Regulation 2022-23


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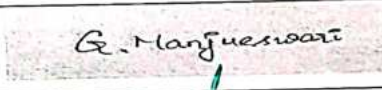
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Members Present:

Chairman	
Dr. V. INTHUMATHI (Chairman)	V. Inthumathi
Internal Members	
Dr. J. JAYASUDHA Assistant Professor	J. Jayasudha
Dr. R. SANTHI Assistant Professor	R. S.
Dr. V. CHITRA Assistant Professor	V. Chitra
Dr. S. SIVASANKAR Assistant Professor	S. S.
Mr. P. SIRAVANAN Assistant Professor	P. Siravanan
Dr. S. KALEESWARI Assistant Professor	S. Kaleeswari
Mrs. A. GNANASOUNDARI Assistant Professor	A. Gnanasoundari
Dr. N. SELVANAYAKI Assistant Professor	N. Selvanayaki
Dr. M. MAHESWARI Assistant Professor	M. Maheswari
Mrs. M. AMSAVENI Assistant Professor	M. Amsaveni
Mr. S. EARNEST RAJADURAI (SF Mathematics) Assistant Professor and Head	S. Earnest Rajadurai
Ms. S. SENPAGAM(SF Mathematics) Assistant Professor	-Absent-
Mr. R. AbinPrakash(SF Mathematics) Assistant Professor	R. AbinPrakash
University Nominee	
Dr. S. MONIKANDAN Associate Professor Department of Mathematics M. S. University Tirunelveli-627 012	S. Monikandan
Academic Experts	
Dr. P. S. SIVAKKUMAR Associate Professor Department of Mathematics Govt. Arts College Udumalpet - 642 126 Mobile No. : 98423 62234	P. S. Sivakumar

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Alumnus nominated by Principal / HoD	
Ms. S. RAGHAVI 1/59, Kuralkuttai, Udumalpet- 642154 (Alumini)	S. Raghavi
Ms. C. KOWSALYAHARISHANTHI 115b, KaliyammanKovil Street Pakkothipalayam Suleeswan Patti(PO) Pollachi - 642 006 Mobile No. : 63747 86242 (Alumni)	C. Kowsalya Harishan
Special Invitees	
Dr. M. SIVASUBRAMANIAN(Academic Auditor UG) Assistant Professor Department of Mathematics Government Arts College Udumalpet-642 126 Mobile No.: 9095542186	
Dr. C. JANAKI(Academic Auditor PG) Assistant Professor Department of Mathematics L.R.G. Govt. Arts College for Women Tiruppur - 641 604 Mobile No. : 73390 90548 E-Mail: janakicsekar@gmail.com	Received the report through online
Student Members	
Ms. K. Kalaivani III B. Sc. Mathematics	
Ms. G. Manjueswari II M. Sc. Mathematics	


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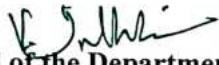

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ANNEXURE I

Minutes of the 12th Meeting – Action Taken Report

S.No	Suggestion given by expert members	Action taken
1.	The suggestion given by the subject expert Dr. Nivetha Martin regarding program outcomes	Implemented
2.	Decided to offer group project/internships in the final year for UG students	Implemented
3.	Certificate course on fundamentals of insurance and actuary.	Implemented



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**List of Courses having focus on local, national, regional and global developmental needs
offered by the Department of Mathematics**

DEPARTMENT OF MATHEMATICS						
Programme: B. Sc., Mathematics					Year: 2022	
Course Code	Course Title	Need				Rationale
		Local	National	Regional	Global	
22UMS101	Classical Algebra			✓		School and College teaching
22UMS102	Calculus			✓		School and College teaching
22UMS1A1	Mathematical Statistics-I		✓			UGC, CSIR and NET exams
22UMS203	Trigonometry, Vector Calculus and Fourier Series			✓		School and College teaching
22UMS204	Analytical Geometry			✓		School and College teaching
22UMS2A2	Mathematical Statistics-II		✓			UGC, CSIR and NET exams
22UMS305	Dynamics			✓		School and College teaching
22UMS306	Numerical Techniques				✓	Employability in IT sector
22UMS3N1	Quantitative Aptitude-I		✓			UGC, CSIR and NET exams
22UMS407	Statics			✓		School and College teaching
22UMS408	Programming in C				✓	Employability in IT sector
22UMS409	Programming lab in C				✓	Employability in IT sector
22UMS4N3	Quantitative Aptitude-II		✓			UGC, CSIR and NET exams
22UMS510	Modern Algebra				✓	Pursue research
22UMS511	Real Analysis-I				✓	Pursue research
22UMS512	Operations Research-I				✓	Pursue research
22UMS513	Complex Analysis				✓	Pursue research


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22UMS5E1	OOP with C++				✓	Employability in IT sector
22UMS5E3	Programming lab in OOP with C++				✓	Employability in IT sector
22UMS5AL	Advanced Operations Research-I				✓	Pursue research
22UMS5S1	Financial Mathematics-I		✓			Employability in Marketing and Insurance sector
22UMS614	Linear Algebra				✓	Pursue research
22UMS615	Real Analysis-II				✓	Pursue research
22UMS616	Operations Research-II				✓	Pursue research
22UMS6E4	Theory of Numbers			✓		School and College teaching
22UMS6E6	Discrete Mathematics			✓		School and College teaching
22UMS6AL	Advanced Operations Research-II				✓	Pursue research
22UMS6S4	Financial Mathematics-II		✓			Employability in Marketing and Insurance sector



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**List of Courses having focus on local, national, regional and global developmental needs
offered by the Department of Mathematics**

DEPARTMENT OF MATHEMATICS						
Programme: M. Sc., Mathematics					Year: 2022	
Course Code	Course Title	Need				Rationale
		Local	National	Regional	Global	
22PMS101	Algebra				✓	Pursue research
22PMS102	Real Analysis				✓	Pursue research
22PMS103	Complex Analysis				✓	Pursue research
22PMS104	Ordinary Differential Equations				✓	Pursue research
22PMS1E1	Matlab				✓	Employability in IT sector
22PMS1E3	Programming Lab in Matlab				✓	Employability in IT sector
22PMS205	Linear Algebra				✓	Pursue research
22PMS206	Mathematical Statistics				✓	Pursue research
22PMS207	Partial Differential Equations				✓	Pursue research
22PMS208	Mechanics				✓	Pursue research
22PMS209	Numerical Analysis				✓	Employability in IT sector
22PMS210	Programming lab in Numerical Analysis using Matlab				✓	Employability in IT sector
22PMS2N1	Mathematical Statistics and Techniques		✓			UGC, CSIR and NET exams
22PMS311	Topology				✓	Pursue research
22PMS312	Functional Analysis				✓	Pursue research
22PMS313	Combinatorics			✓		School and College teaching
22PMS314	Graph Theory		✓			UGC, CSIR and NET exams


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22PMS3AL	Algebraic Number Theory			✓		School and College teaching
22PMS415	Fluid Dynamics		✓			UGC, CSIR and NET exams
22PMS416	Operator Theory		✓			UGC, CSIR and NET exams
22PMS417	Algebraic Topology				✓	Pursue research
22PMS4E1	Mathematical Methods		✓			UGC, CSIR and NET exams


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**List of Courses having focus on employability/ entrepreneurship/ skill development offered
by the Department of Mathematics**

DEPARTMENT OF MATHEMATICS						
Programme: B. Sc. Mathematics					Year: 2022	
Course Code	Course Title	Employability (EM) / Entrepreneurship (EN) / Skill Development (SD)			Focus	Year of Introduction
		EM	EN	SD		
22UMS101	Classical Algebra	✓		✓	To enrich the fundamental concepts of mathematics	
22UMS102	Calculus	✓		✓	Solving Differential equations and Integral equations	
22UMS1A1	Mathematical Statistics-I	✓		✓	Survey, Data Analysis	2013
22UCY1A1	Ancillary Mathematics for Chemistry-I			✓	To apply mathematical concepts in chemistry	
22UPS1A1	Ancillary Mathematics for Physics-I			✓	To solve problems related to mathematical physics	
22UMS203	Trigonometry ,Vector Calculus and Fourier Series	✓		✓	Skill development	
22UMS204	Analytical Geometry	✓		✓	Skill development	
22UMS2A2	Mathematical Statistics-II	✓		✓	Survey, Data Analysis	2013
22UCY2A2	Ancillary Mathematics for Chemistry-II			✓	To apply mathematical concepts in chemistry	
22UCY2A3	Programming Lab for Chemistry using MATLAB		✓		Solving problems & Software Management	2021
22UPS2A2	Ancillary Mathematics for Physics-II			✓	To solve problems related to mathematical physics	
22UPS2A3	Programming Lab for Physics using MATLAB		✓		Solving problems & Software Management	2021
22UMS305	Dynamics			✓	Solving real life problems	
22UMS306	Numerical Techniques			✓	Improving problem solving skills and solving numerical problems. Finding accurate solution	2017

22UMS3N1	NME: Quantitative Aptitude-I	✓		✓	Logical & Verbal reasoning	2013
22UMS3N2	NME: Astronomy I		✓		Explore the History of solar system	
22UMS407	Statics	✓			Solving real life problems	
22UMS408	Programming in C	✓		✓	Improve programming knowledge & Software Management	2013
22UMS409	Programming lab in C		✓		Improve programming knowledge & Software Management	
22UMS4N3	Quantitative Aptitude-II	✓		✓	Logical & Verbal reasoning	2013
22UMS4N4	Astronomy-II		✓		Explore the History of Astronomy	
22UMS510	Modern Algebra	✓			Develop the concept of Algebra Structures to pursue further study	
22UMS511	Real Analysis-I	✓			Skill development , problem solving and pursuing research.	
22UMS512	Operations Research-I	✓		✓	Solving real life problems	2013
22UMS513	Complex Analysis			✓	Pursue research and NET examination	
22UMS5E1	OOP with C++			✓	Software Management	2013
22UMS5E3	Programming lab in OOP with C++			✓	Software Management	
22UMS5AL	Advanced Operations Research-I				Solving real life Problems	
22UMS5S1	Financial Mathematics-I			✓	Debit and credit management	2021
22UMS614	Linear Algebra	✓		✓	Developing the use of Linear Algebra to solve Real time problems as one of the mathematical tool	
22UMS615	Real Analysis-II	✓		✓	Skill development , problem solving and pursuing research.	
22UMS616	Operations Research-II		✓	✓	Solving real life Problems	2013
22UMS6E4	Theory of Numbers	✓		✓	Solving combinatorial and computational problems	

22UMS6E6	Discrete Mathematics	✓		✓	Solving problems connecting various branches of computer science and mathematics	
22UMS6AL	Advanced Operations Research-II				Solving real life Problems	
22UMS6S4	Financial Mathematics-II			✓	Debit and credit management	2021


Head of the Department

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Principal
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Coimbatore District

**List of Courses having focus on employability/ entrepreneurship/ skill development offered
by the Department of Mathematics**

DEPARTMENT OF MATHEMATICS						
Programme: M. Sc., Mathematics					Year: 2022	
Course Code	Course Title	Employability (EM) / Entrepreneurship (EN) / Skill Development (SD)			Focus	Year of Introduction
		EM	EN	SD		
22PMS101	Algebra	✓		✓	Skill development and pursue research	
22PMS102	Real Analysis	✓		✓	Pure research and NET exam	
22PMS103	Complex Analysis			✓	Skill development and pursue research	
22PMS104	Ordinary Differential Equations			✓	Skill development & Solving real life Problems	2013
22PMS1E1	Matlab		✓	✓	Technical Skills on Software Management	2015
22PMS1E2	Special Functions			✓	Solving various classical problems	
22PMS1E3	Programming Lab in MATLAB		✓		Technical Skills on Software Management	
22PMS205	Linear Algebra	✓			Developing the use of Linear Algebra to solve Real time problems as one of the mathematical tool	
22PMS206	Mathematical Statistics	✓	✓	✓	Survey, Data Analysis	2015
22PMS207	Partial Differential Equations			✓	Skill development & Solving real life Problems	2013

22PMS208	Mechanics			✓	Skill development in the field of Physics related to Maths	
22PMS209	Numerical Analysis		✓	✓	Skill development & Solving real life Problems	2015
22PMS210	Programming Lab in Numerical analysis using Matlab		✓		Software Management & Solving real life Problems	2015
22PMS2N1	Mathematical Statistics & Techniques	✓		✓	Survey, Data Analysis	2015
22PMS2N2	Mathematics in Finance		✓	✓	Applying mathematical formulas and equations to financial problems	
22PMS311	Topology	✓			Pursue research	
22PMS312	Functional Analysis			✓	Skill development Problem Solving and applications to real life	
22PMS313	Combinatorics			✓	Skill development (Problem Solving)	2013
22PMS314	Graph theory			✓	Develop to use Graph Theory as a modern mathematical tool in various fields.	
22PMS3E1	Latex		✓	✓	Technical Skills to prepare Research Articles	2013
22PMS3E3	Programming Lab in Latex		✓		Technical Skills to prepare Research Articles.	2013
22PMS3AL	Algebraic Number Theory				Solving combinatorial and computational problems	

22PMS415	Fluid Dynamics	✓			Solving real life problems and pursue research	
22PMS416	Operator Theory	✓			Improve problem solving skills, creativity and research	
22PMS417	Algebraic Topology	✓			Pursue research	2021
22PMS4E1	Mathematical Methods	✓		✓	Skill development	


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More than 20% Changes in B. Sc., Mathematics Syllabus under Regulation 2022

DEPARTMENT OF MATHEMATICS							
S. No.	Course Code	Course Title	Change Details	% of Changes	Content Deleted	Content Updated	Reason for Change
1.	22UMS101	Classical Algebra	Modified	20%	Unit-I : Convergency and Divergency of Series: Some general theorems concerning infinite series – Series of positive terms – Comparison tests – Cauchy's condensation test – D'Alembert's Ratio test – Cauchy's Root test – Raabe's test.	Unit-I : The solution of Numerical Algebraic and Transcendental Equations: Introduction - The Bisection method - The iteration method - The method of false position (Regula Falsi Method) - Newton Raphson method.	Subject Expert
2.	22UPS1A1	Ancillary Mathematics for Physics -I	Modified	55%	-	Unit-I : Characteristic vectors of a matrix Unit-II: Unit-II and Unit-III of previous syllabus were combined and modified as Unit-II Unit-III: Content of Unit-IV	University Nominee and Subject Expert

						included with the topic Exponential Series in Previous syllabus Unit-IV: Solution of Simultaneous Linear Algebraic Equations – Direct Methods: Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method introduced as Unit-IV.	
3.	22UCY2A2	Ancillary Mathematics for Physics -II	Modified	50%	Unit-V: Exponential Series	Unit-I: Unit-I and Unit-II of previous year Syllabus were Combined and modified as Unit-I Unit-II: Introduced Inverse Laplace Transform: Inverse Laplace Transform of some functions-Properties of Inverse Laplace Transform-Problems- Solving Differential Equations	University Nominee and Subject Expert

						using Laplace Transform-Problems as Unit-II. Unit-III: Divergence and curl of a vector point function-Problems-Vector Identities-Problems Unit-V: Gauss Divergence Theorem-stokes theorem-Green's theorem-simple problems are introduced as Unit V.	
4.	22UCY1A1	Ancillary Mathematics for Chemistry -I	Modified	55%		Unit-I :Characteristic vectors of a matrix. Unit-II: Unit-II and Unit-III of previous year syllabus were combined and modified as Unit-II Unit-III: Content of Unit-IV included with the topic Logarithmic series in Previous syllabus Unit-IV: Solution of	University Nominée and Subject Expert

						Simultaneous Linear Algebraic Equations – Direct Methods: Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method are introduced as Unit-IV.	
5.	22UCY2A2	Ancillary Mathematics for Chemistry -II	Modified	50%	-	Unit-I: Unit-I and Unit-II of previous year syllabus combined and modified as Unit-I Unit-II: Inverse Laplace Transform: Inverse Laplace Transform of some functions- Properties of Inverse Laplace Transform-Problems-Solving Differential Equations using Laplace Transform-Problems are introduced as Unit-II Unit-III: Divergence and curl of a vector point function-Problems- Vector Identities-Problems	University Nominee and Subject Expert

						Unit-V: Gauss Divergence Theorem	
6.	22UMS203	Trigonometry, vector calculus and Fourier Series	Modified	25%	Unit-I: Trigonometric Equations-Relations among inverse functions. Unit-II: Period of function-Inverse hyperbolic functions	Unit-I: Unit-I and Unit-II of previous year syllabus were Combined and modified as Unit-I Unit-II: Introduced Convergency and Divergency Seires in Unit-II	Subject Expert
7.	22UMS306	Numerical Techniques	Modified	20%	Unit-I: The solution of Numerical Algebraic and transcendental equations: Introduction-The bisection method-The iteration method-The method of false position (Regula falsi method)- Newton Raphson method.	Unit-I: Part of Unit-I and Unit-II of previous year syllabus were combined and modified as Unit-I Unit-II: Interpolation with unequal intervals: Divided differences-Properties of Divided Differences-Newton's Interpolation Formula for unequal Intervals.	Subject Expert
8.	22UMS511	Real Analysis-I	Modified	20%	Unit-V: Limits and Continuity: Continuous function - Continuity of	Except Unit-V, all other units in previous syllabus are equally	Subject Expert (6 hrs.

					composite functions - Continuity and inverse images of open or closed sets - Connectedness - Uniform continuity - Uniform continuity and compact sets - Discontinuities of real valued functions - Monotonic functions.	splitted into 5 units.	changed as 5 hrs.)
9.	22UMS615	Real Analysis-II	Modified	20%	Unit-IV Comparison theorems-Integrators of bounded variation- Sufficient conditions for existence of Riemann Stieltjes Integral – Necessary conditions for existence of Riemann Stieltjes Integral Unit V: Riemann Stieltjes Integral: Mean value theorems for	Except Unit-I and Unit-V, all other units in previous syllabus are equally splitted into 4 units. Unit-I: Limits and Continuity: Continuous function - Continuity of composite functions - Continuity and inverse images of open or closed sets - Connectedness - Uniform continuity - Uniform continuity and compact sets - Discontinuities of real valued	Subject Expert (6 hrs. changed as 5 hrs.)

					Riemann Stieltjes Integral-The integrals as a function of the interval-Second fundamental theorem of integral calculus-Change of variable in a Riemann integral-Second Mean Value theorem for Riemann integrals.	functions - Monotonic functions.	
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Percentage of Revision of M. Sc., Mathematics Syllabus under Regulation 2022

DEPARTMENT OF MATHEMATICS							
S.No	Course Code	Course Title	Change Details	% of Changes	Content Deleted	Content Updated	Reason for Change
1	22PMS206	Mathematical Statistics	Full paper	100%	-	-	Course Teacher


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N.G.M College - Curriculum Development Cell
B. Sc. Mathematics Scheme of Examination For (2022 – 2025 Batch)
Choice Based Credit System & OBES

For Part I and Part II in First & Second Semesters Only

SEMESTER – I

Part	Subject Code	Title of the Paper	Hrs / Week		Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P		Internal	External		
I	22UTL101 /	Tamil Paper - I /	6	-	3	50	50	100	3
	22UHN101 /	Hindi Paper - I /		-					
	22UFR101	French Paper – I		-					
II	22UEN101	Communication Skills - I (Level I)	5	-	3	50	50	100	3
	22UEN102	Communication Skills - I (Level II)		-					
III	22UMS101	Core - I : Classical Algebra	5	-	3	50	50	100	4
	22UMS102	Core - II :Calculus	6	-	3	50	50	100	4
	22UMS1A1	Allied - I :Mathematical Statistics-I	6	-	3	50	50	100	5
IV	22UHR101	Human Rights	1	-	2	-	50	50	2
	22HEC101	Human Excellence - Personal Values & SKY Yoga Practice – I	1	-	2	25	25	50	1
V		Extension Activities - Annexure I	-	-	-	-	-	-	-
EC	22CFE101	Fluency in English - I	-	-	-	-	-	-	-
		Online Course (Optional) (MOOC / NPTEL / SWAYAM)	-	-	-	-	-	-	Grade
Total			30		19	275	325	600	22

SEMESTER – II									
Part	Subject Code	Title of the Paper	Hrs / Week		Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P		Internal	External		
I	22UTL202 / 22UHN202 / 22UFR202	Tamil Paper - II /	6	-	3	50	50	100	3
		Hindi Paper - II /		-					
		French Paper - II		-					
II	22UEN202	Communication Skills - II (Level I)	5	-	3	50	50	100	3
	22UEN203	Communication Skills - II (Level II)		-					
III	22UMS203	Core - III : Trigonometry, Vector Calculus and Fourier Series	5	-	3	50	50	100	4
	22UMS204	Core - IV: Analytical Geometry	5	-	3	50	50	100	4
	22UMS2A2	Allied - II: Mathematical Statistics II	6	-	3	50	50	100	5
IV	22EVS201	Environmental Studies	2	-	2	-	50	50	2
	22HEC202	Human Excellence - Family Values & SKY Yoga Practice – II	1	-	2	25	25	50	1
V		Extension Activities - Annexure I	-	-	-	-	-	-	-
EC	22CFE202	Fluency in English - II	-	-	-	-	-	-	-
	22CMM201	ManaiyiyalMahathuvam - I	-	-	2	-	50	50	Grade
	22CUB201	UzhavuBharatham - I	-	-	2	-	50	50	Grade
		Online Course (Optional) (MOOC / NPTEL / SWAYAM)	-	-	-	-	-	-	Grade
Total			30		23	275	325	600	22

SEMESTER – III

Part	Subject Code	Title of the Paper	Hrs / Week		Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P		Internal	External		
I	22UTL303 / 22UHN303 / 22UFR303	Tamil Paper - III /	6	-	3	50	50	100	3
		Hindi Paper - III /		-					
		French Paper - III		-					
II	22UEN303 22UEN304	Communication Skills - III (Level I)	5	-	3	50	50	100	3
		Communication Skills - III (Level II)		-					
III	22UMS305	Core - V: Dynamics	5	-	3	50	50	100	4
	22UMS306	Core - VI: Numerical Techniques	4	-	3	50	50	100	3
	22UMS3A1	Allied - III: Physics for Mathematics and Chemistry I	5	3	3	50	50	100	4
IV	22UMS3N1 / 22UMS3N2	Non Major Elective - I : Quantitative Aptitude - I/ Astronomy –I	1	-	2	-	50	50	2
	22HEC303	Human Excellence - Professional Values & Ethics – III	1	-	2	25	25	50	1
V		Extension Activities - Annexure I	-	-	-	-	-	-	-
EC	22CFE303	Fluency in English - III	-	-	-	-	-	-	-
	22CMM302	ManaiyiyalMahathuvam - II	-	-	2	-	50	50	Grade
	22CUB302	UzhavuBharatham - II	-	-	2	-	50	50	Grade
Total			27	3	23	275	325	600	20

SEMESTER – IV									
Part	Subject Code	Title of the Paper	Hrs / Week		Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P		Internal	External		
I	22UTL404	Tamil Paper - IV /	6	-	3	50	50	100	3
	22UTL404	Hindi Paper - IV/		-					
	22UTL404	French Paper – IV		-					
II	22UEN404	Communication Skills - IV (Level I)	5	-	3	50	50	100	3
	22UEN405	Communication Skills - IV (Level II)		-					
III	22UMS407	Core - VII : Statics	4	-	3	50	50	100	4
	22UMS408	Core - VIII : Programming in C	3	-	3	50	50	100	3
	22UMS409	Core Lab IX: Programming lab in C	-	2	3	25	25	50	1
	22UMS4A2	Allied - VI : Physics for Mathematics and Chemistry-II	5	-	3	50	50	100	4
	22UMS4A3	Allied Lab : Physics lab for Mathematics And Chemistry	-	3	3	50	50	100	2
	22UMS4N3 / 22UMS4N4	Non Major Elective - II : Quantitative Aptitude- II/ Astronomy - II	1	-	2	-	50	50	2
IV	22HEC404	Human Excellence -Social Values & SKY Yoga Practice - IV	1	-	2	25	25	50	1
V		Extension Activities - Annexure I	-	-	-	-	-	50	1
EC	22CFE404	Fluency in English - IV	-	-	-	-	-	-	-
	22CMM403	ManaiyiyalMahathuvam - III	-	-	2	-	50	50	Grade
	22CUB403	UzhavuBharatham - III	-	-	2	-	50	50	Grade
Total			25	5	29	350	400	800	24

SEMESTER – V

Part	Subject Code	Title of the Paper	Hrs / Week		Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P		Internal	External		
III	22UMS510	Core - X : Modern Algebra	6	-	3	50	50	100	4
	22UMS511	Core - XI : Real Analysis-I	5	-	3	50	50	100	4
	22UMS512	Core - XII : Skill Enhanced Course: Operations Research-I	5	-	3	50	50	100	4
	22UMS513	Core - XIII : Complex Analysis	5	-	3	50	50	100	4
	22UMS5E1/ 22UMS5E2	Core Elective I : OOP with C++/ Artificial Intelligence and Machine Learning	3	-	3	50	50	100	3
	22UMS5E3	Core Elective Lab II: Programming lab in OOP with C++	-	2	3	25	25	50	1
	22UMS5AL	Advanced Learner Course -I (Optional): Advanced Operations Research - I - Self study	-	-	-	50	50	100	3*
IV	22UMS5S1/ 22UMS5S2	Skill Based Elective - I : Financial Mathematics-I / Network and Information Security	3		2	25	25	50	3
	22HEC505	Human Excellence - National Values & SKY Yoga Practice - V	1	-	2	25	25	50	1
EC	22CFE505	Fluency in English - V	-	-	-	-	-	-	-
	22CSD501	Soft skills Development-I	-	-	-	-	-	-	Grade
	22GKL501	General Awareness-Self Study	SS		2	-	50	50	Grade
	22UMS5VA	Department Specific Value Added Course : Adobe Photoshop	30 hrs		-	-	-	-	2*
Total			28	2	24	375	375	750	24

SEMESTER – VI									
Part	Subject Code	Title of the Paper	Hrs / Week		Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P		Internal	External		
III	22UMS614	Core - XIV :Linear Algebra	6	-	3	50	50	100	4
	22UMS615	Core - XV : Real Analysis II	5	-	3	50	50	100	4
	22UMS616	Core – XVI: Skill Enhanced Course: Operation Research-II	5	-	3	50	50	100	4
	22UMS6E4/ 22UMS6E5	Core Elective III: Theory of Numbers/ Fundamentals of Differential Geometry	5	-	3	50	50	100	5
	22UMS6E6/ 22UMS6E7	Core Elective IV: Discrete Mathematics/ Graph Theory	5	-	3	50	50	100	5
	22UMS6P1	Project	-	-	-	-	50	50	2
	22 UMS6AL	Advanced Learner Course - II (Optional) -Advanced Operations Research - II - Self Study	-	-	-	50	50	100	3*
IV	22UMS6S3/ 22UMS6S4	Skill Based Elective - II : Financial Mathematics-II/ Cryptography	3		2	25	25	50	3
	22HEC606	Human Excellence - Global Values & SKY Yoga Practice - VI	1	-	2	25	25	50	1
EC	22CFE606	Fluency in English-VI	-	-	-	-	-	-	-
	22CSD601	Soft skills Development-II	-	-	-	-	-	-	Grade
	22UMS6VA	Department Specific Value Added Course: Python Training	30 hrs		-	-	-	-	2*
Total			30		19	350	400	750	28
Grand Total									4100140


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Pollachi - 642 001, Coimbatore District.

Programme Code:	B.Sc.	Programme Title:	Mathematics	
Course Code:	22UMS101	Title	Batch:	2022 - 2025
Lecture Hrs./Week or Practical Hrs./Week	5	CLASSICAL ALGEBRA	Semester:	I
			Credits:	4

Course Objective

This course provides the learners a wide spectrum of basic mathematical concepts including summation of series, roots of an equation and matrices.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Apply the numerical methods for approximating the solution to problems of algebraic and transcendental equations.	K3
CO2	Apply the concepts of convergence and divergence of series using various tests like Cauchy's root test, D'Alembert's ratio test to solve problems.	K3
CO3	Solve problems related to Binomial, Exponential and Logarithmic series.	K4
CO4	Apply Newton's method of divisors and Horner's Method to analyze the nature of the roots.	K4
CO5	Diagonalize the matrix using Cayley-Hamilton theorem.	K3

Mapping

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	The solution of Numerical Algebraic and Transcendental Equations: Introduction - The Bisection method - The iteration method - The method of false position (Regula Falsi Method) - Newton Raphson method. Text Book 1: Chapter 3: Sections: 1 - 5.	14
Unit II	Binomial theorem: Application of Binomial theorem to summation of series. Exponential and logarithmic series: The Exponential theorem – Summation - The logarithmic series - Modification of the Logarithmic series - Series which can be summed up by the logarithmic series. Summation of series: Application of partial fractions. Text Book 2: Chapter 3: Section: 10. Chapter 4: Sections: 2.3, 3.1, 5- 7,9, 9.1 (No derivations). Chapter 5: Sections: 2.1, 3.1, 3.2.	13
Unit III	Theory of equations: Symmetric function of roots- Newton's Theorem on the sum of powers of the roots – To increase or decrease the roots of a given equation by a given quantity – Form of the quotient and remainder when a polynomial is divided by a binomial – <i>Removal of terms (Self study).</i> Text Book 2: Chapter 6: Sections: 12, 14 17-19.	13
Unit IV	Theory of equations: Multiple roots – Strum's theorem – Solutions of numerical equations – Newton's method of divisors – Horner's Method. Text Book 2: Chapter 6: Sections: 26, 27, 28.1-28.3, 29.4, 30.	12
Unit V	Fundamental Concepts: Nilpotent – Idempotent – Unitary – Orthogonal Matrices – Related Problems. Characteristic roots and Characteristic vectors: The Characteristic equation of transformation-Properties of the Eigen vectors - Cayley-Hamilton theorem (statement only)-Diagonalization of a Matrix. Text Book 3: Chapter 1. Text Book 3: Chapter 4.	13
	Total Contact Hrs.	65

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.
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Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

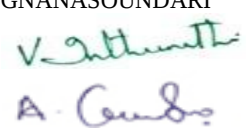
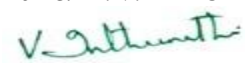
1. Venkataraman M. K, *Numerical Methods in Science and Engineering*, The National Publishing Company, Madras, 2009.
2. Manicavachagompillay T. K, Natarajan T. and Ganapathy K. S, *Algebra Volume I*, S. Viswanathan Pvt. Ltd, First edition, 2010.
3. Kandasamy P. and Thilagavathi K, *Mathematics for B. Sc. Branch - I, Volume II*, First Edition, 2004.

Books for Reference:

1. Ray M. and Sharma H. S, *A text book of Higher Algebra*, S. Chand & Company, 1988
2. Thakur B. R, Sinha H. C, Agarwal B. L. and Johri V. B, *A text book of Algebra*, Ram Prasad & sons, 1970.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.youtube.com/watch?v=BydVprh9NgQ>
2. <https://youtu.be/a05NS7dpbNM>

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Mrs. A. GNANASOUNDARI  Signature	Name: Dr. V. INTHUMATHI  Signature	Name: K. SRINIVASAN  Signature	Name: Dr. R. MANICKACHEZIAN  Signature

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NGM College (Autonomous)
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Programme Code:	B.Sc.	Programme Title :	Chemistry	
Course Code:	22UCY1A1	Title	Batch :	2022 - 2025
		ANCILLARY MATHEMATICS FOR CHEMISTRY-I	Semester	I
Hrs/Week	6		Credits :	4

Course Objective

This course provides a platform to understand the fundamental concepts of Matrices, Theory of Equations, Summation of series and some Special functions.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge about different types of matrices and finding characteristic roots and vectors of a matrix.	K2
CO2	Analyze the relation between roots and coefficients of the polynomial equations.	K3
CO3	Know the concept of Binomial, Exponential, Logarithmic series and their application to summation of series.	K2
CO4	Apply the numerical methods for approximating the solution to problems of algebraic linear equations.	K4
CO5	Solve the problems related to Beta and Gamma functions.	K3

Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Matrices: Symmetric and Skew Symmetric matrices - Hermitian and Skew - Hermitian matrices - Orthogonal and unitary matrices - Characteristic Equation of a matrix – Characteristic vectors of a matrix - Cayley-Hamilton's theorem (without proof) - Simple Problems. Text Book 1: Chapter 5 (Page No. 5.8 - 5.24 and 5.50 - 5.75)	16
Unit II	Theory of Equations: Fundamental theorem in the theory of Equations - Relation between the roots and co-efficient of an Equation - Imaginary and Irrational roots. Text Book 1: Chapter 6: Sections: 1- 4 (Page No. 6.1 - 6.26) Reciprocal Equation - Diminishing the roots of an Equation - Removal of term - Simple Problems. Text Book 1: Chapter 6 : Sections: 6, 9, 10 (Page No.6.30 - 6.37 and 6.49 - 6.56)	16
Unit III	Binomial Series: Summation of Binomial Series - Exponential series - Logarithmic series - Simple Problems. Text Book 1: Chapter 2: Sections: 3 (Page No. 2.4 - 2.21) Chapter 3 Sections: 1, 2 (Page No. 3.1 - 3.23) Chapter 4 (Page No. 4.1 - 4.21)	15
Unit IV	Solution of Simultaneous Linear Algebraic Equations – Direct Methods: Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method Text Book 2: Chapter 4: Sections: 4.1 – 4.3	15
Unit V	Beta, Gamma Functions - Simple Problems. Text Book 1: Chapter 30 (Page No.30.1 - 30.31)	16
	Total Contact Hrs.	78

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

1. Dr. Vittal P. R, *Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.
2. Kandasamy P, Thilagavathy K and Gunavathi K, *Numerical Methods*, S. Chand company Ltd, 2012.

Books for Reference :

Frank Ayres, *Shaum's outline of theory and problem of matrices.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.youtube.com/watch?v=xyAuNHPSq-g>
2. <https://www.youtube.com/watch?v=JoyvDWZ0aMY>

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. V. INTHUMATHI 	Name: Dr. V. INTHUMATHI 	Name: K. SRINIVASAN 	Name: Dr. R. MANICKACHEZIAN 
Signature	Signature	Signature	Signature

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Programme Code:	B.Sc.	Programme Title:	Physics	
Course Code:	22UPS1A1	Title	Batch :	2022 - 2025
		ANCILLARY MATHEMATICS FOR PHYSICS – I	Semester	I
Hrs/Week	6		Credits :	4

Course Objective

This course provides a platform to understand the fundamental concepts of Matrices, Theory of Equations, Summation of series and some Special functions.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge about different types of matrices and finding characteristic roots and vectors of a matrix.	K2
CO2	Analyze the relation between roots and coefficients of the polynomial equations.	K3
CO3	Know the concept of Binomial, Exponential, Logarithmic series and their application to summation of series.	K2
CO4	Apply the numerical methods for approximating the solution to problems of algebraic linear equations.	K4
CO5	Solve the problems related to Beta and Gamma functions.	K3

Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Matrices: Symmetric and Skew Symmetric matrices - Hermitian and Skew - Hermitian matrices - Orthogonal and unitary matrices - Characteristic Equation of a matrix – Characteristic vectors of a matrix - Cayley-Hamilton's theorem (without proof) - Simple Problems. Text Book 1: Chapter 5 (Page No. 5.8 - 5.24 and 5.50 - 5.75)	16
Unit II	Theory of Equations: Fundamental theorem in the theory of Equations - Relation between the roots and co-efficient of an Equation - Imaginary and Irrational roots. Text Book 1: Chapter 6: Sections: 1- 4 (Page No. 6.1 - 6.26) Reciprocal Equation - Diminishing the roots of an Equation - Removal of term - Simple Problems. Text Book 1: Chapter 6 : Sections: 6, 9, 10 (Page No.6.30 - 6.37 and 6.49 - 6.56)	16
Unit III	Binomial Series: Summation of Binomial Series - Exponential series - Logarithmic series - Simple Problems. Text Book 1: Chapter 2: Sections: 3 (Page No. 2.4 - 2.21) Chapter 3 Sections: 1, 2 (Page No. 3.1 - 3.23) Chapter 4 (Page No. 4.1 - 4.21)	15
Unit IV	Solution of Simultaneous Linear Algebraic Equations – Direct Methods: Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method Text Book 2: Chapter 4: Sections: 4.1 – 4.3	15
Unit V	Beta, Gamma Functions - Simple Problems. Text Book 1: Chapter 30 (Page No.30.1 - 30.31)	16
	Total Contact Hrs.	78

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

1. Dr. Vittal P. R, *Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.
2. Kandasamy P, Thilagavathy K and Gunavathi K, *Numerical Methods*, S. Chand company Ltd, 2012.

Books for Reference :

Frank Ayres, *Shaum's outline of theory and problem of matrices.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.youtube.com/watch?v=xyAuNHPsq-g>
2. <https://www.youtube.com/watch?v=JoyvDWZ0aMY>

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Name: Dr. V. INTHUMATHI 	Name: Dr. V. INTHUMATHI 	Name: K. SRINIVASAN 	Name: Dr. R. MANICKACHEZIAN 
Signature	Signature	Signature	Signature

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Programme Code:	B.Sc.	Programme Title:	Mathematics	
Course Code:	22UMS203	Title	Batch:	2022 - 2025
Lecture Hrs./Week or Practical Hrs./Week	5	TRIGONOMETRY, VECTORCALCUL US AND FOURIER SERIES	Semester:	II
			Credits:	4

Course Objective

This paper enables the students to provide basic knowledge of trigonometry, vector calculus and Fourier series.

Course Outcomes (CO)

On successful completion of this course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic concepts of vector analysis, trigonometry, differentiation and integration.	K1
CO2	Apply the differential operator to solve vector differential equations.	K3
CO3	Solve the multiple integrals by applying Gauss divergence theorem, Stoke's theorem and Green's theorem.	K3
CO4	Compute the expansion of trigonometric function as multiple of θ and a series of powers of θ .	K3
CO5	Find Fourier series expansion for odd and even functions of a given period and can apply to solve problems in mathematical physics.	K3

Mapping

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	M	H	M	M	H	H
CO2	H	M	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	M	H	H
CO5	H	H	H	H	H	H	H	H	H

H -

HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Expansions and Inverse circular functions: Expansions of $\cos^n \theta$ and $\sin^n \theta$ - Expansions of $\cos n\theta$ and $\sin n\theta$ - Power series for $\sin x$ and $\cos x$ – Related problems. Text Book 1: Chapter 3: Sections: 1-3. Circular and Hyperbolic Functions: Exponential function - Circular functions - hyperbolic functions - Relations between circular and hyperbolic functions- Related problems. Text Book 1: Chapter 6: Sections: 6.1 – 6.4.	14
Unit II	Convergency and Divergency of Series: Some general theorems concerning infinite series – Series of positive terms – Comparison tests – Cauchy’s condensation test – D’Alembert’s Ratio test – Cauchy’s Root test – Raabe’s test. Text Book 2: Chapter 2: Sections: 11-20.	13
Unit III	Fourier Series: Definition - Finding Fourier co-efficient for given periodic functions with period 2π and $2l$ - Even and odd functions - Half range series. Text Book 3: Chapter 6: Sections: 1 – 6.1.	13
Unit IV	Vector differentiation: Gradient, Curl and Divergence- Scalar and vector point functions - Level surface - Gradient of a scalar point function - Directional derivative of a scalar point function - Theorems (statement only) - Equations of tangent plane and normal line to a level surface (Self study) - Divergence and curl of a vector point function - Solenoidal vector - Irrotational vector - Vector identities. Text Book 4: Chapter 1.	12
Unit V	Vector integration: Line integral - Theorems on line integrals - Surface and Volume integrals - Gauss Divergence theorem - Stoke’s theorem - Green’s theorem in plane. (Statement only and relevant problems). Text Book 4: Chapter 2.	13
	Total Contact Hrs.	65

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.
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Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Duraipandian P., Laxmi Duraipandian and Jayamala paramasivan, Trigonometry, Emerald Publishers, 1999.
2. Manicavachagompillay T. K, Natarajan T. and Ganapathy K. S, *Algebra Volume I*, S. Viswanathan Pvt. Ltd, First edition, 2010.
3. Narayanan S., Manicavachagom Pillay T. K., Calculus Volume III, Viswanathan S (Publishers and Printers), 2010.
4. Vittal P. R. and Malini V., Vector Analysis, Margham Publication, 1997.

Books for Reference:

1. Gupta R., Vector Calculus, Firewall Media, 2005.
2. Narayanan S. and Manicavachagom pillay T. K., Trigonometry, Viswanathan S (Publishers and Printers), 2012.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://nptel.ac.in/courses/111/105/111105122/>
2. <http://www.math.odu.edu/~jhh/Volume-2.PDF>
3. https://www.whitman.edu/mathematics/calculus_online/chapter16.html
4. <https://nptel.ac.in/courses/111/107/111107108/>

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Programme Code:	B.Sc.	Programme Title :	Physics	
Course Code:	22UPS2A2	Title	Batch :	2022-2025
		ANCILLARY MATHEMATICS FOR PHYSICS-II	Semester	II
Hrs/Week	6		Credits :	4

Course Objective

This paper enables the students to acquire the ability in solving problems in hyperbolic functions, Laplace and Inverse Laplace transforms and vector calculus.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of circular functions and hyperbolic functions.	K2
CO2	Apply Laplace transform for solving differential equations.	K3
CO3	Apply the concepts of Gradient, Curl and Divergence in computing vector differentiation problems.	K3
CO4	Compute problems on line integral, surface integral and volume integral.	K4
CO5	Solve the multiple integrals by applying Gauss divergence theorem and Green's theorem.	K4

Mapping

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	M	H	H
CO5	H	H	H	H	M	M	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Hyperbolic functions: Relations between circular and hyperbolic functions - Addition formula for hyperbolic functions - Problems. Chapter 14: Sections: 1-9 (Pg. No. : 14.31 to 14.37 and 14.40 to 14.55) Laplace Transform: Definition - Laplace transform of elementary function - Linear Property – Shifting Property - Change of scale property - Laplace transform of derivatives - Laplace transform of integrals - Multiplication by t - problems. Chapter 27: Sections: 1,2 (Pg. No. : 27.1 to 27.20)	15
Unit II	Inverse Laplace Transform: Inverse Laplace Transform of some functions-Properties of Inverse Laplace Transform-Problems-Solving Differential Equations using Laplace Transform-Problems. Chapter 27: Sections: 4, 5 (Pg. No. : 27.23 to 27.62)	16
Unit III	Vector Differentiation: Gradient, Curl and Divergence – Problems-Divergence and Curl of a Vector point function-Problems-Vector Identities-Problems. Chapter 28 (Pg. No.: 6 to 53)	16
Unit IV	Vector Integration: Line Integral - Surface Integral - Volume Integral - Simple Problems. Chapter 29 (Pg. No. : 59 to 88)	15
Unit V	Vector Integration: Gauss Divergence Theorem(without proof) -Stoke's Theorem(without proof) -Green's theorem (without proof) - Simple Problems. Chapter 29 (Pg. No.: 94 to 141)	16
	Total Contact Hrs.	78

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.
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Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Vittal P. R, *Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.

Books for Reference:

1. Murray R. Spiegel, *Shaum's outline of theory and problem of vector analysis*.
2. Murray R. Spiegel, *Shaum's outline of theory and problem of Laplace transform*.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.youtube.com/watch?v=Pq-tUQzeSRw>
2. <https://www.youtube.com/watch?v=M0H1UJbn-V4>

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Programme Code:	B.Sc.	Programme Title :	Chemistry	
Course Code:	22UCY2A2	Title	Batch :	2022-2025
		ANCILLARY MATHEMATICS FOR CHEMISTRY-II	Semester	II
Hrs/Week	6		Credits :	4

Course Objective

This paper enables the students to acquire the ability in solving problems in hyperbolic functions, Laplace and Inverse Laplace transforms and vector calculus.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of circular functions and hyperbolic functions.	K2
CO2	Apply Laplace transform for solving differential equations.	K3
CO3	Apply the concepts of Gradient, Curl and Divergence in computing vector differentiation problems.	K3
CO4	Compute problems on line integral, surface integral and volume integral.	K4
CO5	Solve the multiple integrals by applying Gauss divergence theorem and Green's theorem.	K4

Mapping

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	M	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	M	H	H
CO5	H	H	H	H	M	M	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Hyperbolic functions: Relations between circular and hyperbolic functions - Addition formula for hyperbolic functions - Problems. Chapter 14: Sections: 1-9 (Pg. No. : 14.31 to 14.37 and 14.40 to 14.55) Laplace Transform: Definition - Laplace transform of elementary function - Linear Property – Shifting Property - Change of scale property - Laplace transform of derivatives - Laplace transform of integrals - Multiplication by t - problems. Chapter 27: Sections: 1,2 (Pg. No. : 27.1 to 27.20)	15
Unit II	Inverse Laplace Transform: Inverse Laplace Transform of some functions-Properties of Inverse Laplace Transform-Problems-Solving Differential Equations using Laplace Transform-Problems. Chapter 27: Sections: 4, 5 (Pg. No. : 27.23 to 27.62)	16
Unit III	Vector Differentiation: Gradient, Curl and Divergence – Problems-Divergence and Curl of a Vector point function-Problems-Vector Identities-Problems. Chapter 28 (Pg. No.: 6 to 53)	16
Unit IV	Vector Integration: Line Integral - Surface Integral - Volume Integral - Simple Problems. Chapter 29 (Pg. No. : 59 to 88)	15
Unit V	Vector Integration: Gauss Divergence Theorem(without proof) -Green's theorem (without proof) - Simple Problems. Chapter 29 (Pg. No.: 94 to 107 and 129 to 141)	16
	Total Contact Hrs.	78

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.
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Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Vittal P. R, *Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.
Books for Reference:

1. Murray R. Spiegel, *Shaum's outline of theory and problem of vector analysis*
2. Murray R. Spiegel, *Shaum's outline of theory and problem of Laplace Transform.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.youtube.com/watch?v=Pq-tUQzeSRw>
2. <https://www.youtube.com/watch?v=M0H1UJbn-V4>

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Name: Dr. V. INTHUMATHI 	Name: Dr. V. INTHUMATHI 	Name: K. SRINIVASAN 	Name: Dr. R. MANICKACHEZIAN 
Signature	Signature	Signature	Signature

3.

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Programme Code:	B.Sc.	Programme Title:	Mathematics	
Course Code:	22UMS306	Title	Batch:	2022 - 2025
Lecture Hrs./Week or Practical Hrs./Week	4	NUMERICAL TECHNIQUES	Semester:	III
			Credits:	3

Course Objective

This course helps the students to have an in-depth knowledge of various advanced methods in numerical analysis. The students to use numerical techniques to get numerical solutions of equations like transcendental and non-linear differential equations when ordinary analytical methods fail.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the need of numerical analysis techniques in the areas of approximation theory, and recall some basic concepts.	K1
CO2	Apply the numerical methods for approximating the solution to problems of algebraic and transcendental equations, simultaneous linear equations.	K3
CO3	Estimating the value of a function for any intermediate value of the independent variable using Newton Forward and Backward interpolation Formula as well compute the derivatives using Newton's forward and backward difference formula and Sterling's formula.	K3
CO4	Solve the ordinary and partial differential equations by using Numerical method techniques like Taylors method, Euler's method, RungeKutta method etc.	K4
CO5	Enrich the knowledge of numerical techniques and getting insight of algorithmic approach.	K4

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	M	M	M	M	H	M
CO2	H	H	H	H	M	M	M	H	M
CO3	H	H	H	H	H	H	H	H	M
CO4	H	H	H	H	H	H	H	H	M
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Simultaneous Linear Algebraic Equations: Introduction – Gauss Elimination Method – Gauss Jordan Method – Computation of the inverse of a Matrix using Gauss’s Elimination Method. Chapter 4: Sections: 1 – 3. Simultaneous Linear Algebraic Equations: Iterative Methods - Gauss-Jacobi Method – Gauss-Seidal Method – <i>Comparison of Gauss elimination and Gauss-Seidal Iteration methods (Self study).</i> Chapter 4: Sections: 6, 7.	11
Unit II	Interpolation: Introduction - Linear interpolation - Gregory Newton Forward and Backward interpolation Formula - Equidistant terms with one or more missing values. Chapter 6: Sections: 1 - 5. Interpolation with unequal intervals: Divided differences-Properties of Divided Differences-Newton’s Interpolation Formula for unequal Intervals. Chapter 8: Sections: 1 - 3.	10
Unit III	Numerical Differentiation: Introduction - Newton’s forward difference formula to compute the derivatives - Newton’s backward difference formula to compute the derivatives - Derivatives using Stirling’s formula. Chapter 9: Sections: 1 - 4. Numerical Integration: The Trapezoidal rule - Romberg’s method - Simpson’s one third rule - Practical applications of Simpson’s rule. Chapter 9: Sections: 8 -10 and 12.	10
Unit IV	Numerical Solution of Ordinary Differential Equations: Solution by Taylor Series - Taylor Series method for higher order differential equations- Euler’s method - Improved Euler’s method - Modified Euler method - RungeKutta method - Second order RungeKutta Method - <i>Higher order RungeKutta methods (Self study).</i> Chapter 11: Sections: 6, 8, 10 - 15.	10

Unit V	Numerical Solution of Partial Differential Equations: Elliptic equations – Solution of Laplace’s equation by Iteration – Poisson’s equation. Chapter 12: Sections: 5, 6, 7.	11
	Total Contact Hrs.	52

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

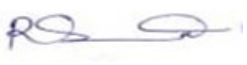
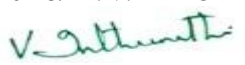
Venkataraman M. K, *Numerical Methods in Science and Engineering*, The National Publishing Company, Madras, 2009.

Book for Reference:

Kandasamy P, Thilagavathy K and Gunavathi K, *Numerical Methods*, S. Chand company Ltd, 2012.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

<https://nptel.ac.in/courses/111/107/111107105/>

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Programme Code:	B.Sc.	Programme Title:	B.Sc. Mathematics	
Course Code:	22UMS511	Title	Batch:	2022 - 2025
		REAL ANALYSIS - I	Semester:	V
Lecture Hrs./Week or Practical Hrs./Week	5		Credits:	4

Course Objective

To enable the learner to get into basic concepts of Real Analysis and obtain a foundation for further study in analysis.

Course Outcomes (CO)

On successful completion of the course student will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the fundamental properties of the real numbers which underpin the formal development of real analysis.	K2
CO2	Apply the concepts of closure and interior of sets, continuity, convergence to effectively communicate mathematics.	K3
CO3	Calculate the limits of various types of sequences, discuss the nature of continuity and analyze their properties.	K3
CO4	Analyze the applications of intersection theorem, covering theorems and Bolzano-Weierstrass theorem.	K4
CO5	Understand the structure of a metric space and deal with the notions of continuity, completeness and connectedness.	K2

Mapping

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	M	M	M	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	The Real and Complex number Systems: Introduction - The field axioms - The order axioms – Geometric representation of real numbers-Intervals - Integers - The unique factorization theorem for integers - Rational numbers - Irrational numbers - Upper bounds, maximum element, least upper bound - The completeness axiom - Some properties of the supremum - Properties of the integers deduced from the completeness axiom Chapter 1: Sections: 1.1 - 1.13	13
Unit II	The Real and Complex number Systems: The Archimedean property of the real number system- Absolute values and the triangle inequality - The Cauchy Schwarz inequality - Plus and minus infinity and the extended real number system $\mathbb{R}^*$. Chapter 1: Sections: 1.14 - 1.20 (Except 1.15 - 1.17). Some Basic Notations of Set Theory: Ordered pairs - Cartesian product of two sets - Relations and functions - One to one functions and inverses - Composite functions - Sequences -Similar sets - Finite and infinite sets - Countable and uncountable sets - Uncountability of the real number system. Chapter 2: Sections: 2.3 - 2.13 (Except 2.6).	14
Unit III	Some Basic Notations of Set Theory: Set algebra-Countable collection of countable sets. Chapter 2: Sections: 2.14, 2.15. Elements of Point Set Topology: Euclidean space $\mathbb{R}^n$ - Open balls and open sets in $\mathbb{R}^n$ - The structure of open sets in $\mathbb{R}^1$ - Closed sets. Chapter 3: Sections: 3.2 - 3.5.	12
Unit IV	Elements of Point Set Topology: Adherent points, Accumulation points - Closed sets and adherent points - The Bolzano-Weierstrass theorem - The Cantor intersection theorem - Lindelof covering theorem - The Heine-Borel covering theorem- Compactness in $\mathbb{R}^n$ -Metric spaces.- Point set topology in metric spaces. Chapter 3: Sections: 3.6 - 3.14.	13
Unit V	Elements of Point Set Topology: Compact subsets of a metric space - Boundary of a set. Chapter 3: Sections: 3.15, 3.16. Limits and Continuity: Convergent sequences in a metric space - Cauchy sequences - Complete metric spaces - Limit of a function - Limits of vector valued functions. Chapter 4: Sections : 4.2 - 4.5, 4.7	13
	Total Contact Hrs.	65

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.
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Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:Tom M. Apostol, *Mathematical Analysis*, Addison Wesley, Second Edition 2002.**Books for Reference:**

1. Ralph P. Boas, *A primer of Real function*, The mathematical Association of America, 1960.
2. Walter Rudin, *Principles of Mathematical Analysis*, Third Edition, McGraw Hill Inter Editions, 1976.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. <https://nptel.ac.in/courses/111/106/111106053/>
2. <https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/>
3. <https://cosmolearning.org/courses/real-analysis-with-prof-sh-kulkarni/>

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name: Dr. S. KALEESWARI 	Name: Dr. V. INTHUMATHI 	Name:K. SRINIVASAN 	Name:Dr. R.MANICKACHEZIAN 
Signature	Signature	Signature	Signature

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Programme Code:	B.Sc.	Programme Title:	Mathematics	
Course Code:	22UMS615	Title	Batch:	2022 - 2025
Lecture Hrs./Week or Practical Hrs./Week	5	REAL ANALYSIS – II	Semester:	VI
			Credits:	4

Course Objective

To equip the students for study in Real analysis by introducing further some of advanced topics in Real Analysis.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and use abstract mathematical concepts of derivatives and functions of bounded variation.	K2
CO2	Apply the properties of monotonic functions and continuous functions of bounded variation in the context of real analysis.	K3
CO3	Apply the ideas of total variation and step into the theory of Riemann Stieltjes Integral.	K3
CO4	Analyze the Riemann Integral and Riemann-Stieltjes integral in detail and write complete, correct and coherent proofs.	K4
CO5	Enhance higher order learning and demonstrate how abstract ideas in real analysis can be applied to practical problems.	K4

Mapping

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	H
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	Limits and Continuity: Continuous function - Continuity of composite functions - Continuity and inverse images of open or closed sets - Connectedness - Uniform continuity - Uniform continuity and compact sets - Discontinuities of real valued functions - Monotonic functions. Chapter 4: Sections: 4.8, 4.9, 4.12, 4.16, 4.19, 4.20, 4.22, 4.23.	12
Unit II	Derivatives: Introduction - Definition of derivative – Derivatives and continuity - Algebra of Derivatives – The chain rule – One sided Derivatives and infinite derivatives - Functions with nonzero derivative – Zero derivatives and local extrema Chapter 5: Sections: 5.1 - 5.8.	13
Unit III	Derivatives: Rolle's theorem - The Mean Value Theorem for derivatives – Intermediate value theorem for derivatives - Taylor's formula with remainder. Chapter 5: Sections: 5.9 - 5.12. Functions of Bounded Variations: Introduction - Properties of monotonic functions Chapter 6: Sections: 6.1, 6.2.	14
Unit IV	Functions of Bounded Variations: Functions of bounded variations - Total variations - Additive property of total variation - Total variation on $[a, x]$ as a function of x - Functions of bounded variation expressed as the difference of increasing functions - Continuous functions of bounded variation. Chapter 6: Sections: 6.3 - 6.8. The Riemann-Stieltjes Integral: Introduction - Notation - The definition of Riemann-Stieltjes Integral - Linear properties. Chapter 7 : Sections: 7.1 - 7.4.	13
Unit V	The Riemann-Stieltjes Integral: Integration by parts - Change of variable in Riemann-Stieltjes integral - Reduction to a Riemann integral - Step functions as integrators - Reduction of a Riemann-Stieltjes integral to a finite sum - Euler's summation formula- Monotonically increasing integrators - Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition. Chapter 7: Sections: 7.5 - 7.13.	13
	Total Contact Hrs.	65

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Tom M. Apostol, *Mathematical Analysis*, Narosa Publishing House, Second Edition 2002.

Books for Reference:

1. Goldberg R. R, *Methods of Real Analysis*, Oxford and IBH Publishing Co., 1973.
2. Soma Sundaram D, Choudhary B, *A first course in Mathematical Analysis*, Narosa Publishing House, 1996.
3. Walter Rudin, *Principles of Mathematical Analysis*, McGraw Hill Inc, Third Edition, 1976.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/>
2. <https://cosmolearning.org/courses/real-analysis-with-prof-sh-kulkarni/>

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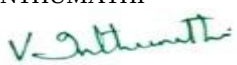
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Programme Code:	B.Sc.	Programme Title:	Mathematics	
Course Code:	22UMS6P1	Title	Batch:	2022 - 2025
Lecture Hrs./Week or Practical Hrs./Week	-	PROJECT	Semester:	VI
			Credits:	2

Components of the Project may be included the following

Review No.	Activity
I	Problem Identification and Related Literature collection
II	Analyzing or solving problems by applying different methodology
III	Giving conclusion

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